DISPLAY UNIT

Cross-Reference to Related Applications

This application is a continuation of U.S. Patent Application Serial No. 09/270,610 of John B. Rosen for a DISPLAY UNIT, filed on March 17, 1999 which is a continuation of U.S. Patent Application Serial No. 08/884,445 of John B. Rosen for a DISPLAY UNIT, filed June 27, 1997 and which also is a continuation-in-part of U.S. Design Patent Application Serial No. 29/083,926 of John B. Rosen for a CEILING-MOUNTED MONITOR SYSTEM, filed on February 18, 1998, which continues from U.S. Design Patent Application Serial No. 29/058,538 of John B. Rosen for a CEILING-MOUNTED MONITOR SYSTEM, filed on August 16, 1996.

Technical Field

The present invention relates generally to display units, and more particularly, to a display unit configured for use in presenting a viewing surface to occupants of an automobile such as a car, a truck, a sport utility vehicle (SUV), or a passenger van.

Background Art

Automotive manufacturers have long sought to make passengers as comfortable as possible during travel, focusing both on physical comfort and on the passenger's entertainment. For example, vehicle sound systems have become standard accessories in most cars and trucks. In recent years, efforts have involved attempts to bring video technology into the passenger compartment, either in the form of a television, a computer, or a video game display.

Unfortunately, display units have heretofore been impractical as automotive accessories due to problems in mounting conventional display units within a vehicle. One problem relates to the size of most display units, it being difficult to find space for a standard-size monitor in most vehicles. Another problem arises from difficulties in placing the display unit in a position where it may be viewed by a passenger, but will not obstruct the driver's view of the road. Still another problem involves the stowability of the display unit, and its corresponding effect on passenger safety.

Known display units also have been unable to meet consumer expectations due to difficulties in providing acceptable picture quality in a package of suitable size. However, with advancements in flat-panel display technology, picture quality of smaller display units has improved dramatically. Additionally, it has become possible to separate some of the electronic circuitry from the flat-panel display, further reducing the thickness of these displays. The present invention takes advantage of these improvements by providing a stowable display unit which is suited for mounting in an interior region of an automobile without compromising picture quality.

Disclosure of the Invention

The aforementioned goals and objectives are met by provision of a display unit which includes a housing configured for mounting in an interior region of an automobile, and a screen mounted on the housing for movement between a stowed position wherein the screen is at least partially contained within the housing and a deployed position wherein the screen projects from the housing to reveal a viewing surface of the screen.

The display unit further includes a lock mechanism adapted to selectively retain the screen in the stowed position. Upon release of the lock mechanism, however, the screen is free to be pivoted away from the stowed position, and in one embodiment, is automatically pivoted at least partially away from the stowed position.

These and other objects and advantages of the present invention will be more readily understood after a consideration of the drawings and the detailed description of the preferred embodiment which follows.

Brief Description of the Drawings

Fig. 1 is an isometric view of a display unit constructed in accordance with the present invention, the display unit including a screen shown in a stowed position.

Fig. 2 is an isometric view similar to that of Fig. 1, but with the screen pivoted to a deployed position.

Fig. 3 is a side view of the display unit shown in Figs. 1 and 2.

Fig. 4 is a somewhat simplified side view of an automotive interior illustrating use of the display unit depicted in Figs. 1, 2 and 3.

Fig. 5 is a sectional side view of a first alternative embodiment display unit, the display unit screen being shown in successive positions by dashed lines.

Fig. 6 is an isometric view of a second alternative embodiment display unit, the display unit including a screen in a stowed position.

Fig. 7 is a side view of the display unit of Fig. 6, but with the screen in an intermediate position.

Fig. 8 is an isometric view of the display unit of Fig. 6, but with the screen in a deployed position.

Fig. 9 is an end view of the display unit of Fig. 6, the screen being deployed to reveal a track, carriage and hinge arrangement for use in deploying the screen.

Detailed Description of the Preferred Embodiment and Best Mode of Carrying Out the Invention

Referring initially to Figs. 1 through 4, a display unit is shown for use in an interior region of an automobile 10, such display unit being indicated generally at 12. Although the invention has broad utility, the display unit is shown mounted on the ceiling 10a of the automobile, preferably overhead and generally forward of the of the passenger seating area 14 so as to accommodate viewing thereof by one or more rear-seat passengers P.

The display unit includes a generally planar mounting frame structure in the form of a housing 20, and a corresponding screen 30, which is mounted on the housing for movement between a stowed position (Fig. 1) and a deployed position (Fig. 2). In the stowed position, the screen is contained within the housing, a viewing surface 32 thereof typically facing downward into the passenger compartment. In the deployed position, the screen projects from the housing to present the screen's viewing surface to rear-seat passenger P. The screen's viewing surface thus selectively is placed in the rear-seat passenger's line-of-sight 16.

In accordance with my teachings, housing 20 will be seen to include a perimeter structure 22 having a proximal portion closer to the passenger seating area and a *distal* portion more remote from the passenger seating area. The housing defines a cavity 24 configured to receive the screen when the screen is placed in its stowed position. The cavity is of predetermined shape and size, typically conforming substantially to the shape and size of the viewing screen. It will be noted in Figs. 1 and 2, for example, that cavity 24 is configured to accommodate fitted receipt of screen 30 such that the screen is fully contained within the cavity.

The housing typically is embedded in the ceiling, the automobile being provided with a ceiling recess configured for receipt of the housing. Accordingly, the perimeter structure includes a generally planar flange 26 which may be secured to the ceiling via conventional fasteners such as screws. The flange is configured to conform to the contour of the ceiling, and preferably defines the lowermost surface of the housing. The housing thus may be flush-mounted with the ceiling. Furthermore, when the screen is in its stowed position with the screen contained within the cavity, the screen's viewing surface is flush with the flange, and correspondingly, is flush with the automobile's ceiling.

In the depicted embodiment, the screen is separated from a video control module 40 which directs operation of the screen. The control module typically is mounted on the perimeter structure beside the screen and is connected to the screen via a ribbon wire or

the like. This keeps the display unit relatively thin. In the depicted embodiment, for example, the display unit is approximately ½-inch to 1½-inches thick.

As indicated, viewing screen 30 is hinged to the housing adjacent the distal portion thereof to accommodate reversible swaying thereof in an upright plane which extends both through the housing and through the passenger seating area. The screen thus is deployed by pivot thereof about a first axis A which corresponds generally to a first edge 30a of the screen. To deploy the screen, the screen is pivoted in a rearward direction to a deployed position where the screen is at an angle θ from horizontal. In the depicted embodiment, θ is within a range of between approximately 45-degrees and 90-degrees. This presents the screen's viewing surface to rear-seat passenger P. The screen also may be retracted to its stowed position, again by pivot of the screen about axis A. Pivot occurs about a hinge which is shown generally at 34.

The screen also is pivotal about a second axis B which is transverse to first axis A. Accordingly, the screen is adjustable by side-to-side rotation of the screen so as to selectively face the screen's viewing surface toward a rear-seat passenger. The screen's viewing surface thus may selectively be placed in the rear-seat passenger's line of sight.

The display unit also employs a locking mechanism which selectively maintains the screen in its stowed position. The locking mechanism includes a catch 52 mounted on the housing and configured to selectively engage a corresponding recess or detent 54 in the screen's second edge 30b. The locking mechanism is operable via a lever 56 which extends (and retracts) the catch for capture (and release) by recess 54.

A first alternative embodiment display unit is shown at 112 in Fig. 5, the alternative display unit differing from display unit 12 primarily by its provision of a break-away screen 130. The screen is mounted on a display unit housing 120, typically for pivot between a stowed position and a deployed position to present a viewing surface 132 to a passenger in the passenger viewing area.

As indicated, display unit 112 is suited for use in an automobile 10, the display unit typically being embedded in the automobile ceiling with housing 120 flush-mounted on ceiling 10a. The screen is hingedly attached to the housing via break-away hinge 134 for pivot between a generally horizontal first orientation wherein the screen is at least partially contained within cavity 124, and a second orientation wherein the screen extends downwardly from the cavity to present the screen's viewing surface to a vehicle occupant for viewing.

In its first orientation (shown in solid lines), screen 130 is in a stowed position where the screen is contained within cavity 124, the screen's viewing surface facing upwardly into the cavity so as to protect the viewing surface from damage. The screen is stowed adjacent control module 140, and may be locked in place by locking mechanism 150.

Upon deployment, the screen is pivoted under a first torque from its first orientation (shown in solid lines at 130) to its second orientation (shown in dashed lines at 130') where the screen is in a deployed position with the screen extending downwardly from the ceiling at an angle α of between approximately 45-degrees and 90-degrees. The

screen thus is pivoted though an angle ϕ which is between approximately 90-degrees and 135-degrees. The screen's viewing surface 132' faces rearwardly and downwardly toward the automobile's rear-seat passengers.

Upon application of a second, higher torque, the screen may be pivoted from the second orientation (shown in dashed lines at 130') to its third orientation (shown in dashed lines at 130'') where the screen rests against the housing in a break-away position. This is accomplished via a two-phase hinge 134 which defines a first range of motion (between the first and second orientations) wherein the screen pivots upon application of a first torque, and a second range of motion (between the second and third orientations) wherein the screen pivots upon application of a higher second torque. As will be appreciated by those skilled in the art, the change in torque creates a soft stop with the screen in the second orientation, a feature which provides for quick deployment of the screen.

The ability of the screen to pivot to the third orientation serves as a safety feature, the screen effectively being configured to collapse in the event of an emergency. It will be understood, for example, that the depicted screen will pivot forward from the second orientation upon contact by a rear-seat passenger who is thrown forward in a collision, but only upon application of a predetermined threshold force. Similarly, the screen is configured to pivot toward the rear of the vehicle upon application of an opposite force. In either event, the screen will yield upon application of sufficient force, and thus will not act as a hard stop of the type which may cause injury to vehicle occupants.

Figs. 6 through 9 show a second alternative embodiment of the invented display unit at 212, such display unit being adapted for use in a vehicle having a sunroof or the like. It will be noted that the display unit includes a surface-mounted housing 220. The housing defines a cavity 224 which is configured to house a screen 230 having a viewing surface 232. The screen may be deployed to reveal the viewing surface, typically first by translation in a plane defined by the screen, and second by pivot about an axis defined by hinge 234. The screen thus typically is mounted on a carriage 236 for translation along a track 238. The hinge is positioned along a predetermined edge of the screen to provide for pivot of the screen once it has been removed from the cavity.

In Fig. 6, the screen is shown in its first position where the screen is contained within the cavity in a generally horizontal orientation. From the first position, the screen is translated along track 236 to an intermediate position with the screen still in the generally horizontal orientation. Fig. 7 shows the screen in the intermediate position. Thereafter, the screen is pivoted about a first axis A to a second position where the screen extends downwardly from the cavity to present the screen to a vehicle occupant for viewing. Fig. 8 shows the screen in the second position. The screen also may be rotatable about a second axis B which is transverse to the first axis.

The screen is configured to pass forwardly in the vehicle along track 236, and then to pivot rearwardly to the deployed orientation under a predetermined first torque. The screen typically will pivot downstream to an angle of between approximately 45-degrees and 90-degrees from horizontal such that the viewing surface may be readily seen by rear-

seat passengers. It is possible, however, to provide for further downstream pivot of the screen under a higher second torque to provide for emergency collapse of the screen.

While the invention has been disclosed in its preferred form, the specific embodiments thereof as disclosed and illustrated herein are not to be considered in a limiting sense as numerous variations are possible. Applicant regards the subject matter of the invention to include all novel and non-obvious combinations and subcombinations of the various elements, features, functions and/or properties disclosed herein. No single feature, function, element or property of the disclosed embodiments is essential. The following claims define certain combinations and subcombinations which are regarded as novel and non-obvious. Other combinations and subcombinations of features, functions, elements and/or properties may be claimed through amendment of the present claims or presentation of new claims in this or a related application. Such claims, whether they are broader, narrower or equal in scope to the original claims, are also regarded as included within the subject matter of applicant's invention.